# BEM Micro-credential



| | Micro-credentials title | **Microcontroller programming for traffic information systems** | | |
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| | Micro-credentials purpose | The purpose of the microcredential program is to gain knowledge about microcontrollers, their features and applications. Training for design and performance analysis of devices based on microcontrollers. Real-time microcontroller programming training. | | |
| | Target groups (to whom is intended) | Employees in production companies who want to be further educated, unemployed, people who want to retrain. | | |
| | Sector | Electronics industry | | |
| | Area(s) of Application/Operating Environment | Industry, transportation etc. | | |
| | Typical Jobs/Work Assignments | Creation of digital circuits and firmware; assembly preparation and subsequent approval; change and support of the existing firmware; examination and correction of possible errors in the operation of the microcontroller; production support and participation in various types of tests. | | |
| **BEM content (for all partners)** | Learning outcomes (professional and key competencies) | Knowledge: <br><br> • Defines the term microcontroller; <br> • Explain the programming procedure of a modern microcontroller; <br> • Describes the microcontroller ports. <br> • Explain the software development environment; <br> • Distinguishes data types and uses them; <br> • Explain the programming and reprogramming procedure of a microcontroller; <br> • Differentiates the types of digital outputs; <br> • Differentiates work with digital sensors. | Skills: <br><br> • Uses program modules; <br> • Use libraries of built in functions; <br> • Uses language structures; <br> • Transfers firmware from the computer to the microcontroller; <br> • Manages analog inputs (reading analog sensor values); <br> • Uses pwm – pulse-width modulation; <br> • Connects the elements of the microcontroller system according to the attached diagram; <br> • Models a simple microcontroller system with different types of sensors and actuators; <br> • Connects the system to the computer and transfers data to and from the computer. | Key competencies <br><br> • Development of a simple system with a microcontroller; <br> • Connects the system to the peripherals (Display with LED diodes, LCD displays, touch-sensitive displays, digital and analog sensors) <br> • Firmware testing and changing; |
| | Check | *Criteria* <br> • suitability - reliability; (compliance of the assessment with established, public and precise assessment criteria); | | *Procedures* <br> • formation of the examination committee; |

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| | | • validity; (evaluation shows the effects of learning - achievement of results, engagement and progress of participants;<br>• diversity of assessment methods: (choice of appropriate and application of different assessment methods and techniques in order to ensure validity, reliability and objectivity of assessment);<br>• evaluation without discrimination and selection on any basis; | • determining the list of tasks for the exam;<br>• extracting work tasks;<br>• checking competence by creating tasks;<br>• examination records;<br>• awarding of certificates; |
| | Recognized/Accepted by (Confirmed by Memorandum of Understanding) | Company name:<br>*Johnson Electric d.o.o. Nis, Serbia*<br>*DMV Control Systems, Nis, Serbia* | |
| | Organizers of training and development | JPOA / Publicly recognized organizers of adult education programmes | |
| **Additional information (if applicable)** | Requirements for attending training | Level 3, i.e. level 4 of NQFS (National Qualifications Framework In Serbia), obtained by completing a three-year, i.e. four-year secondary vocational education on educational profiles in the field of mechanical engineering and metalworking or the field of electrical engineering. | |
| | Recommended training duration | | |
| | | Training duration 125 hours | |
| **Detailed content**<br><br>**(national, if applicable)** | Place in existing educational programs | Informal training | |
| | Reference to the national qualification framework | 4th level of National Qualifications Framework In Serbia (NQFS) ; 4th level European Qualifications Framework (EQF). | |
| | Number of credits | 5 | |